Center for Agricultural Policy and Trade Studies
North Dakota State University

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The Corn Industry's Impact on North Dakota's Economy

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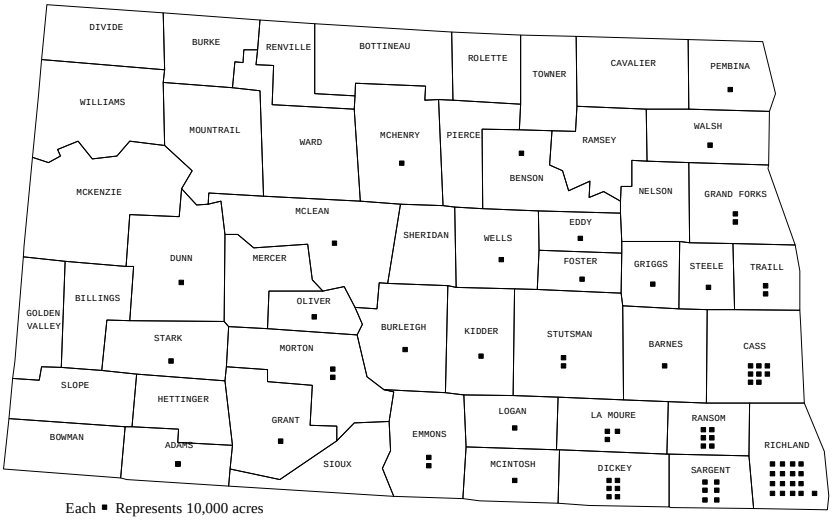
INTRODUCTION

During the last thirty years, the impact of North Dakota corn industry on the state's economy has grown tremendously. In the 1970s, corn acres were about 2% of the state's cropland. Today that number is over 10%. In addition to the additional planted acres, corn processing, for both high fructose corn syrup and ethanol, has become major users of North Dakota's corn. The gross economic activity of the aggregate corn sector is larger than the amount of planted corn acres indicates because corn is a high value and high cost crop. An acre of corn will generate more economic activity than an acre of any other crop.

Since the passage of the 1996 FAIR Act, the production shares of North Dakota crops have changed dramatically. Figure 1 shows the planted acres of corn in North Dakota in 1996, by county. The majority of the state's corn was grown in six counties in the southeastern corner of the state.



Each ▪ Represents 10,000 acres
Figure 1. North Dakota Planted Corn Acres, 1996

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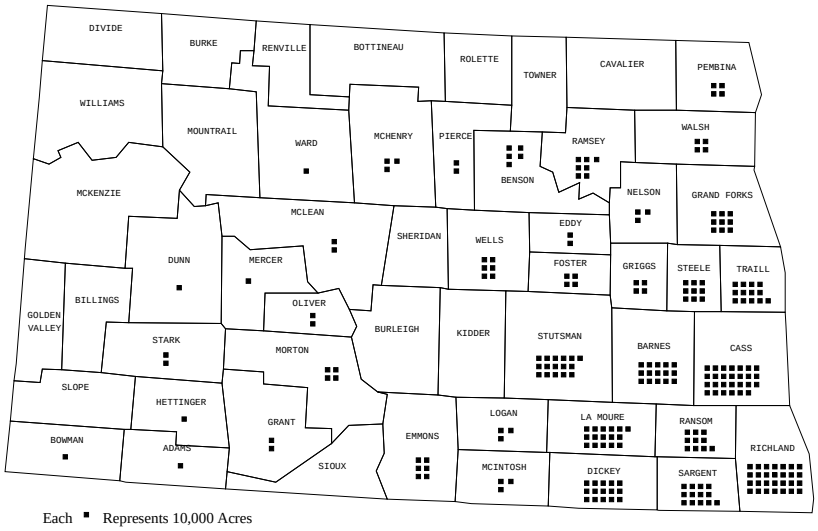
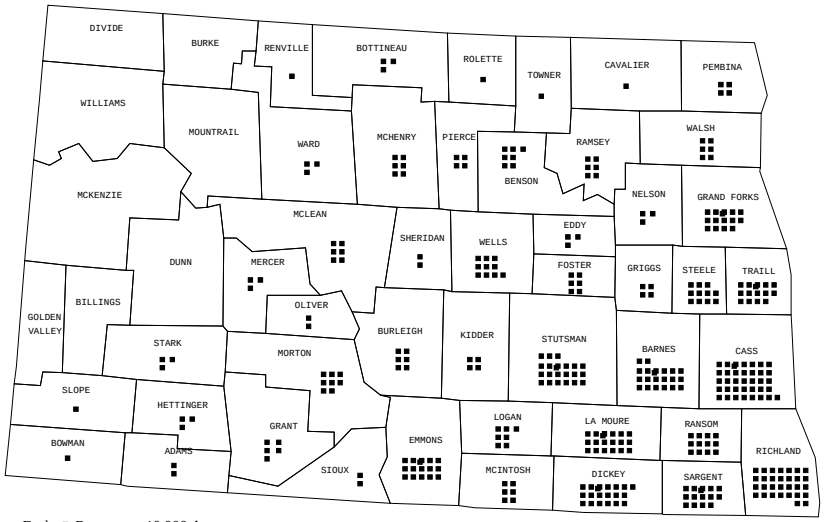
In 2008, corn production had spread west to Emmons county and north to Benson county (Figure 2). In 2012, corn production had spread west to Morton county and north to Bottineau and Pembina counties (Figure 3). Between 1996 and 2008, most growth was concentrated in the southeastern corner and the east central portion of the state. Between 2008 and 2012, most growth occurred in the central portion and the northeastern corner of the state.



Each ▪ Represents 10,000 Acres
Figure 2. North Dakota Planted Corn Acres, 2008



Each ▪ Represents 10,000 Acres
Figure 3. North Dakota Planted Corn Acres, 2012

The objective of this study is to estimate the economic contribution of the North Dakota corn sector on the state's economy, including both production and processing. For this study, the additional economic value generated from the corn sector above alternative crops, wheat and soybeans is estimated since corn is competing with wheat and soybeans for cropland, depending on the region within the state. In addition, revenues from the various corn processing plants will be estimated to determine the economic impact of the processing industry.

METHOD

Various assumptions were introduced for this study. They are as follows.

1. All commodities grown in North Dakota are sold in North Dakota by North Dakota producers.

2. In the southeastern region and Red River Valley, the alternative crop to corn is soybeans. In the rest of the state the alternative crop is wheat.

3. The processing plants in the state purchase about 80% of their corn from within the state.

Total economic contribution from the two activities, production and processing, are calculated to evaluate the economic impact of the corn industry on the North Dakota economy. The impact of corn fed to livestock is not estimated as it is difficult to obtain data on cattle numbers and feed consumption. This implies that the estimated contribution to the state's economy should be larger than estimated.

CORN PRODUCTION

The gross returns for the production of corn, soybeans and wheat are calculated as

$Gr = ac * y * p$
where
Gr= gross returns from each crop
ac= planted crop acres
y= yield of each crop
p= price of each crop

Table 1 shows the planted acres of corn, soybeans, and wheat in North Dakota from 2008 to 2012. Corn acres increased from 2.3 million acres in 2008 to a high of 3.46 million acres in 2012. Corn acres increased from 800 to 900 thousand acres during the late 1980s and early 1990s. Soybeans acre increased from 600-700 thousand acres since the late 1980s to early 1990s to 4.7 million acres in 2012 (Figure 4). Wheat acres have increased since 2008, however, wheat acres have decreased about 40% from the recent high of 12.9 million acres in 1996. Total acres of the three crops increased from 13.8 million acres in 2008 to about 16.8 million acres in 2012.

Table 1. Total Harvested Corn Acres and Per Acre Returns for Corn and Alternative Crops

Planted Acres	Corn	Soybeans	Wheat	Total
	----------1,000 acres----------			
2008	2,300	3,755	7,760	13,815
2009	1,698	3,845	6,590	12,133
2010	1,885	4,060	8,400	14,345
2011	2,060	3,942	8,414	14,416
2012	3,460	4,691	8,640	16,791
Per Acre Returns	Corn	Soybeans	Wheat	
	----------dollars/acre----------			
2008	463.76	272.35	369.27	
2009	368.36	278.00	249.67	
2010	661.32	370.73	284.23	
2011	610.05	344.85	215.94	
2012	835.70	483.32	263.16	
Five Year Average	587.84	349.65	276.45	

Source: UDSA-ERS, USDA-NASS

This indicates that producers have concentrated production away from other crops including barley, oats, and sunflowers. There are about 26 million acres of cropland in North Dakota which indicates that over 60% of the crop acres are used for the production of corn, soybeans and wheat.

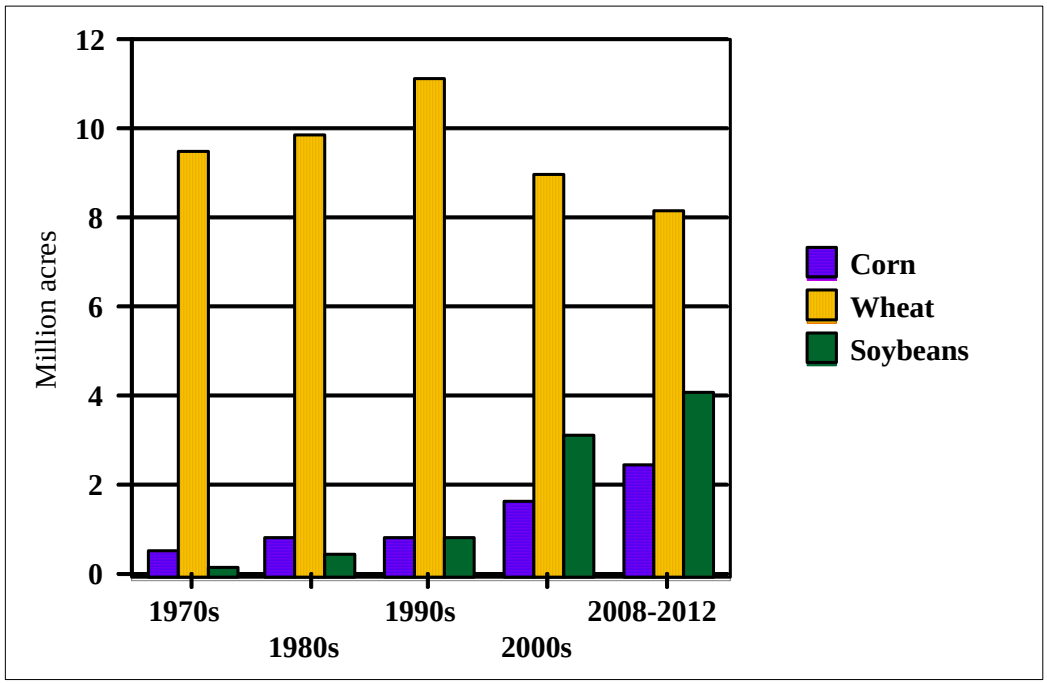


Figure 4. Planted Acres for North Dakota Corn, Wheat, and Soybeans

Total revenue for corn, soybeans and wheat are shown in Table 1. During the 1970s, 1980s, and 1990s, revenue shares of corn and soybeans to North Dakota's gross agricultural revenue was small compared to wheat (Figure 5). However, during the 2000s, revenue increased to $1.45 billion for wheat, $454 million for corn and $646 million for soybeans. During 2008-2012, revenue increased to $2.23 billion for wheat $1.42 billion for corn, and $1.45 billion for soybeans; the combined revenue account for both corn and soybeans is 129% of wheat revenue (Figure 6). The trend is clear, corn and soybeans production will continue to expand into the near future.

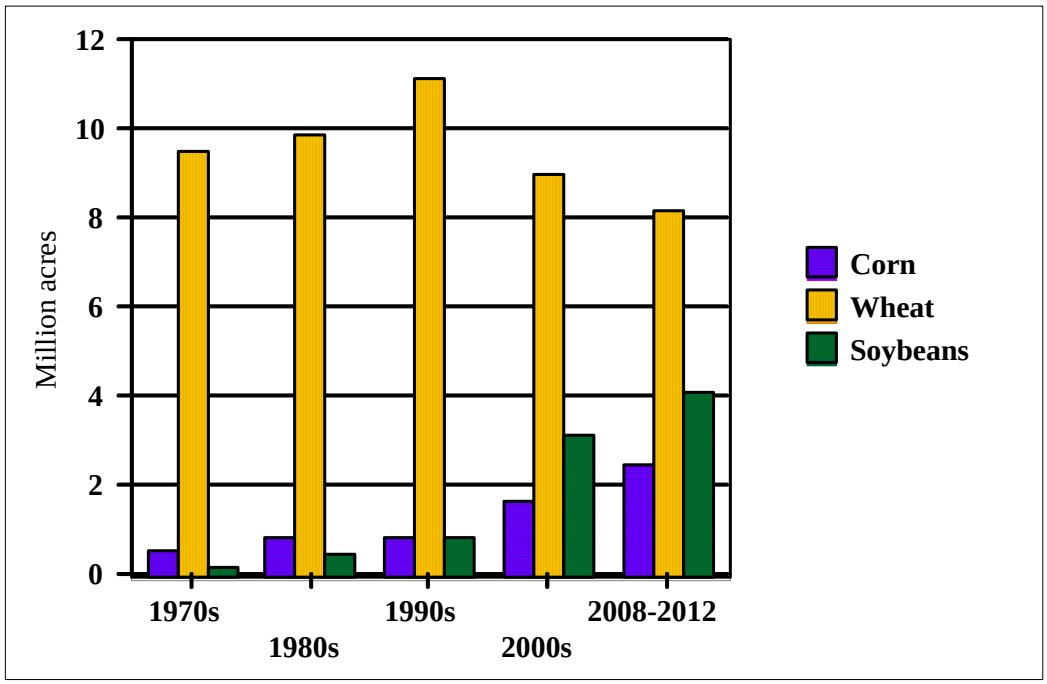


Figure 5. North Dakota Gross Commodity Returns for Corn, Wheat, and Soybeans

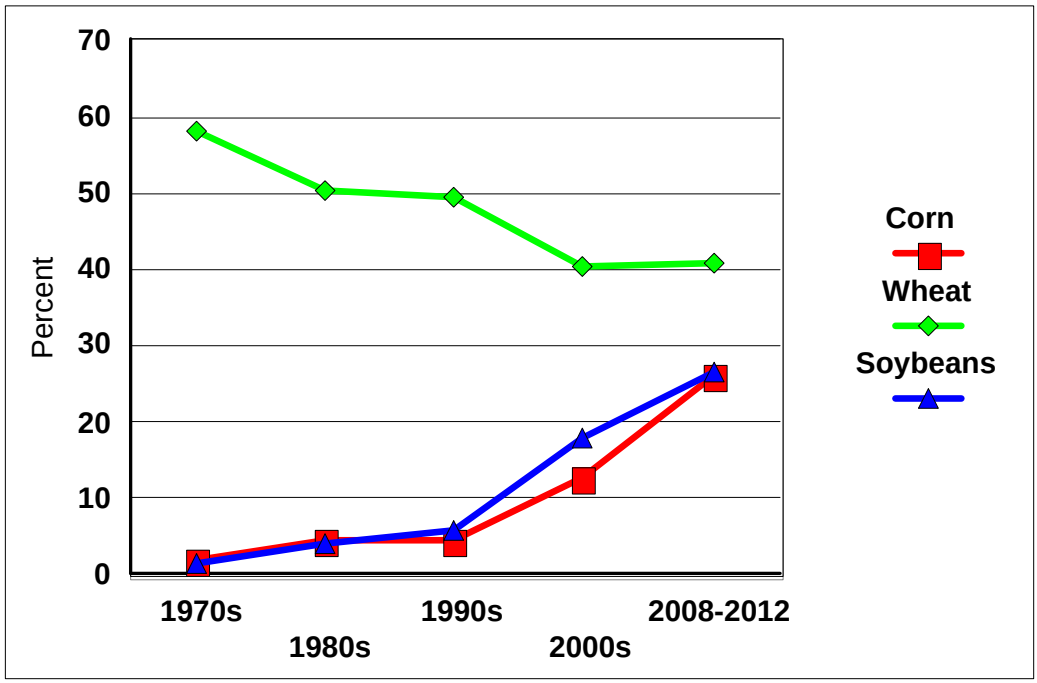


Figure 6. Market Share, Value Basis for North Dakota Corn, Wheat, and Soybeans

From Table 1 it is clear that corn is a higher grossing crop than either soybeans or wheat, therefore corn will generate more economic activity than the other crops. In 2008, corn generated $464/acre compared to $272/acre for soybeans and $369/acre from wheat. Corn generated on average 52% more revenue than either soybeans or wheat. In 2012, corn generated 123% more economic activity than soybeans and wheat. Over the five year period corn generated 89% more economic activity per acre than the alternative crops. Yields in the RRV and the Southeastern

region are higher than yields across the state. If corn was not planted in North Dakota, soybeans would replace most of the acres in the southeast and RRV and wheat acres would replace corn acres in the other regions of the state.

CORN PROCESSING

North Dakota's corn processing industry consists of four ethanol plants and one high fructose corn syrup (HFCS) plant (Table 2). The ethanol plant in Walhala closed in late October, 2007 and the Richardson and Underwood plant opened during 2007. The plant in Hankinson was completed and opened in September of 2008 and the Casselton plant opened in late 2008. The processing plant in Wahpeton is a HFCS processing facility that has been in operation since 1996. A proposed ethanol plant in Spiritwood is under planning. Total corn processing capacity of the plants are 174 million bushels or about 41% of North Dakota's corn crop using 2012 as a base. About 80% of the corn is purchased from North Dakota farmers (energynd.com).

Prices used in the study are shown in Table 3. These are obtained from USDA and represent yearly state averages. To avoid double counting of corn, the cost of North Dakota corn purchased by the processing facilities was removed from the total revenue of the plants.

Table 2. North Dakota Corn Processing Plants

	Operation	Date started	Corn capacity	Ethanol output	DDG
			Million bu	million gal	million lbs
Walhala	Closed 10/07	1995	0	0	0
Richardson	Open	2007	18	56	340
Hankenson	09/08	2008	52	98	595
Underwood	Open	2007	23	56	340
Casselton	12/08	2008	50	98	595
Spiritwood	Not Open	2013	35	64	394
Wahpeton	Open	1996	31	1,093*	527
*Million pounds HFCS					

Source: National Energy Center of Excellence

ECONOMIC CONTRIBUTION

Table 4 shows the increased to economic value of corn production over soybeans and wheat production in North Dakota. The differences were obtained by calculating the difference between per acre returns for corn and soybeans and those between corn and wheat. Those differences were multiplied by the acres of corn to determine gross revenue of corn production.

For example, in 2008, corn generated $191.41 per acre more returns than soybeans and $94.49 per acre more than wheat. Therefore, if corn was not planted for North Dakota in 2008, an additional 2.3 million acres of soybeans and wheat would have been planted. That would have generated $384 million less in gross revenue than the actual plantings. This assumes that in the RRV and the southeastern region, soybeans replaces corn and wheat replaces corn in the rest of the state. In 2012 corn revenue was $881 million higher than soybeans would have been and almost $462 million more than wheat, for a total gross revenue of $1.34 billion. The increase in gross returns from corn over wheat and soybeans were $374 million for 2008. The five year average increase in gross returns over wheat and soybeans is $590 million because of North Dakota corn production.

Table 3. Prices Used in Analysis

	Corn	Ethanol	DDG	HFCS
	$/bu	$/gallon	$/ton	$/cwt
2008	3.74	2.18	153.54	24.50
2009	3.18	1.63	109.24	25.88
2010	5.01	1.77	112.43	21.82
2011	5.81	2.56	192.90	21.65
2012	6.85	2.24	232.84	24.47

Source: UDSA-ERS

The total economic contribution from the production of corn in North Dakota varied between $626 million in 2009 and $2.89 billion in 2012 (Table 4). The five year average was $1.42 billion per year.

Table 5 shows the annual gross revenue for the North Dakota corn processing plants. Until 2009, the Wahpeton plant dominated the North Dakota corn processing industry with gross revenues of about $215 million. In 2012, gross revenue from Hankenson and Casselton was $144.1 million and $138.6 million, respectively. Underwood and Richardson generated $63.7 million and $49.9 million, respectively. The HFCS plant in Wahpeton generated $141.8 million in 2012. The total revenue for the corn processing industry in 2012 was about $538 million.

Table 4. Difference Between Corn and Alternative Crops and Total Contribution				
	Corn vs Soybeans Difference	Corn vs Wheat Difference	Total Difference	Total Contribution
	----------$1,000----------		----------$ million---------	
2008	286,200	87,700	373.9	1,066.6
2009	68,600	15,800	84.3	625.5
2010	368,100	210,300	578.9	1,246.6
2011	373,700	195,600	569.3	1,256.7
2012	881,300	461,900	1,343.1	2,891.5
Five Year Average	395,580	194,260	589.8	1,417.4

The five year total revenue is $2.64 billion or $527.7 million per year. Largest revenues were generated by Wahpeton, followed by Casselton and Hankinson.

The total impact of the North Dakota corn industry on the state's economy including both production and processing is an annual average of $1.95 billion for the 2008-2012 period and $$3.43 billion in 2012 (Table 6). The five year total revenue from 2008 to 2012 is $7.09 billion for corn production and $2.64 billion for corn processing.

SUMMARY

Corn has become a major agricultural crop in North Dakota during the past 10 years. In the mid-1990s corn was produced in 3 or 4 counties in the southeast corner of the state. Since that time, corn production has spread northward to the Canadian border and westward beyond the Missouri River. Planted acres have grown by 148% during the past 10 year to where almost 1 in every 7 acres in the state is planted to corn. The total economic contribution of corn production has grown to about $1.42 billion per year or $7.1 billion over the past 5 years (2008-2012).

Table 5. Economic Returns from the North Dakota Corn Processing Industry						
	2008	2009	2010	2011	2012	Average
	----------million $----------					
Richardson	79.5	53.2	34.3	74.9	49.9	58.3
Hankenson	57.4	38.4	99.0	216.3	144.1	111.0
Underwood	101.6	67.9	43.8	95.7	63.7	74.5
Casselton	17.1	147.6	95.2	208.0	138.6	121.4
Wahpeton	198.3	214.8	128.6	128.2	141.8	162.4
Spiritwood	0.0	0.0	0.0	0.0	0.0	0.0
Total	454.5	521.9	400.8	732.1	538.1	527.7

Table 6. Economic Impact of the North Dakota Corn Industry on the State's Economy						
	2008	2009	2010	2011	2012	Average
	----------million $----------					
Production	1,066.6	625.5	1,246.6	1,256.7	2,891.5	1,417.4
Processing	454.5	521.9	400.8	732.1	538.1	527.7
Total	1,521.1	1,147.4	1,647.4	1,988.8	3,429.6	1,945.1

That impact is above and beyond the revenue that would have been generated if those acres were planted to soybeans or wheat. The economic contribution above soybean or wheat production would be about $590 million per year.

The revenue for the North Dakota corn processing industry was $454.5 million in 2008. That grew to $538.1 million by 2012. The revenue averaged $528 million over the five year period.

The estimated 5 year impact of the corn industry (2008-2012), both production and processing is $9.7 billion. In 2012 that impact was about $3.42 billion. To put that into perspective, the entire North Dakota wheat crop generated gross revenues of $2.04 billion in 2012. Corn has grown into a major segment of North Dakota agriculture. When processing is included, corn is one of the largest agricultural economic value generating segments within the state.

REFERENCES

United States Department of Agriculture, Economic Research Service. Website: www.ers.usda.gov

United States Department of Agriculture, National Agricultural Statistic Service. Quick stats. Website: www.nass.usda.gov

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